instruction manual

"T" NOBATRONS

Sorensen & Company, inc.

Richards Avenue

South Norwalk, Conn.

GENERAL INFORMATION

PLEASE READ THIS MANUAL. We think it will help you to obtain the maximum performance from your new Sorensen instrument.

SHIPPING DAMAGE

Sometimes instruments are damaged in transit. We strongly suggest that you inspect and test your instrument as soon as you receive it. If the instrument is damaged or if it fails to operate properly, you should ask the carrier to inspect the shipment. The carrier's claim agent will prepare a report of damage which you should send to us. We will then tell you how to have the instrument repaired or replaced.

SERVICE INFORMATION

If you have any questions about the operation, repair, or servicing of a Sorensen instrument, please contact our local representatives. (A list of representatives appears at the rear of this manual.) If it is more convenient you may contact us directly at the Service Department, Sorensen & Co., Inc., Richards Avenue, South Norwalk, Connecticut.

IMPORTANT

BE SURE TO INCLUDE THE MODEL & SERIAL NUMBER IN ALL CORRESPONDENCE CONCERNING THIS INSTRUMENT. WITHOUT THIS INFORMATION WE MAY NOT BE ABLE TO GIVE YOU PROMPT AND ACCURATE SERVICE.

RETURNS TO THE FACTORY

Should you decide to return an instrument to us for repair, please contact us for authorization to make shipment. We have a number of local service facilities in the United States and Canada which are equipped and staffed to provide you with fast, efficient service. For this reason, we reserve the right to refuse unauthorized shipments to our plant.

WARRANTY

This instrument is warranted by Sorensen & Company, Inc., to be free from defects in material and workmanship. Our obligation under the warranty is limited to servicing the instrument and replacing defective parts* when the instrument is returned to the factory with transportation charges prepaid. No other warranties may be implied. The period of warranty is one year after the delivery of the instrument to the original purchaser. Defects caused by improper operating conditions, accidents, misuse, negligence, and the alteration or removal of the nameplate, will void the warranty.

*With the exception of tubes and fuses.

"T" NOBATRONS

INSTRUCTION MANUAL

CONTROLLED
DOCUMENT

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SORENSEN & COMPANY, INC., Richards Avenue, South Norwalk, Connecticut

14-1879F 2/61

II. SPECIFICATIONS

The "T" Nobatron is a tubeless, variable voltage, DC power supply, possessing excellent line voltage regulation and transient response for line and load pulses. "T" Nobatrons may be supplied as self-contained units, or for rack mounting. Also two Model T50-1.5 units may be arranged side by side as a self contained instrument or a 19" rack.

MODEL		T50-1.5	T60-5	T120-2.5
Input Voltage, A. C.		95-130V, 1 phase, 60 cycles		
Input Current, Max.		1.75 amps	6.0 amps	
Output Voltage, D. C.				
3 Ranges	1.	0-10V	0-10V	0-20V
	2.	0-25V	0-25V	0-50V
	3.	0-50V	0-60V	0-120V
Output Current, Max.		1.5 amps	5.0 amps	2.5 amps
Output Regulation, Line				
105-125VAC Input		± 1%	± 0.5%	± 0.5%
95-130VAC Input		± 2%	± 1%	± 1%
Internal Resistance				
Max. Ohms.	Range 1.	1.5 ohms	0.35 ohms	1.3 ohms
	Range 2.	3.0 ohms	0.55 ohms	2.0 ohms
	Range 3.	6.0 ohms	1.00 ohms	4.0 ohms
Ripple, Max.		50 millivolts, maximum		
Ambient Temperature Range		$15^{\circ}C$-$40^{\circ}C$		
Dimensions	Rack	8-3/4" panel	10-1/2" panel	
	Cabinet	10-3/4" W. 9-1/4" H. 12" D.	19-3/4" W. 10-7/8" H. 14-7/8" D.	
Weight		38 lbs.	98 lbs.	93 lbs.
Input Terminals		Line Cord, rear		
Output Terminals		Binding Posts, front panel		
On-Off Switch		Combined with Range Switch	Combined with Over-current Breaker	
Output Overcurrent Protection		Fuse, 1.5 Amp	Magnetic Circuit Breaker	
Input Fuse		1.5 amp, panel	5 amp, rear	
Meters		Voltmeter Standard	Voltmeter & Ammeter, Standard	

III. INSTALLATION AND OPERATION

TERMINALS & CONTROLS

1. Input Connection

The input power is applied by means of a line cord utilizing a three prong plug. Since the third prong of this plug is connected to the chassis, connection of the line cord to the appropriate receptacle automatically grounds the equipment. If the user does not have three prong outlets available, he should use an adapter. The user should make sure that the extra wire (coded green) coming out from the adapter is solidly grounded to the power line wiring system, preferably soldered. The aforementioned should be carried out for safety reasons.

2. Output Connection

The DC output is available at the two binding posts located on the front panel. The input is isolated from the output, and the entire circuitry is isolated from the chassis ground. This DC output is "floating" and hence may be grounded at either the plus or minus terminal.

CAUTION: In no instance should the output be connected to an external potential of over 250 volts to ground. Over 250 volts may cause a breakdown of the instrument's components.

3. On-Off AC Power Switch

The On-Off switch is either combined with the output voltage range switch or an overcurrent breaker.

4. Output Range Switch

The output range switch located on the front panel determines the selected output range and the corresponding voltmeter range. On some models it is combined with the On-Off Switch

5. Pilot Lamp

A pilot lamp is provided on the front panel to indicate when the AC power is applied. The pilot lamp remains lit even though F1; fuse is blown.

6. DC Voltmeter and Ammeter

A DC voltmeter is provided on the front panel to indicate output voltage. The voltmeter multipliers automatically change with the range switch. The voltmeter will not read if F2 is blown.

On some models (refer to specs.) a DC ammeter is provided for reading output current.

7. DC Voltage Control Knob

A DC voltage control knob which is provided on the front panel actuates a variable auto-transformer. This transformer gives full output voltage adjustment from zero to the rated DC output of the range selected.

FUSES & PROTECTIVE DEVICES

1. The AC Protective Fuse protects the internal variable auto transformer (voltage control) and other components from injury due to internal short circuits, etc. This fuse should normally never need replacing.

2. The DC output overcurrent protection is directly connected in the DC output circuit to protect the instrument against external overload or short circuits. This device is either a fuse or an overcurrent breaker (see specs.) The DC voltmeter will not read if this device has opened due to overload. The circuit breaker must be reset manually after overload.

CAUTION: Always replace the fuses with an exactly rated duplicate. An oversize fuse may cause breakdown of components, especially in germanium rectifiers.

OPERATION

CAUTION: BEFORE OPERATION IS BEGUN, PLEASE REVIEW THE PRECEDING SECTION WITH REGARD TO CONTROLS.

1. Plug the input line cord into a 115V, 60 cycle outlet. See A-1 above .

2. Set the DC Output Range Switch to the desired output range.

CAUTION: In order to prevent damage to the voltmeter or range switch, always turn the DC Output Control Knob to zero voltage or turn the power off before operating the DC Range Switch.

3. Turn on the AC power (on-off) switch. Note that the pilot light will now be lit and the voltmeter will simultaneously correspond to the selected range.

4. Adjust the output adjustment knob to obtain the exact voltage desired within the range selected.

   NOTE: It is always desirable to select the lowest voltage range possible, for this permits smoothest control, maximum voltmeter deflection, and the lowest internal impedance. The lower the internal impedance, the better the regulation (against load variation).

IV. PRINCIPLE OF OPERATION

The "T" Nobatron DC power supplies are designed to eliminate line voltage variations from affecting the DC output voltage by means of a constant voltage transformer connected prior to the rectifiers. Unlike conventional regulator principles, these instruments do not eliminate load current variations from affecting the DC output voltage, but by using low impedance rectifiers, impedance of the DC section is minimized. Rectification is accomplished by means of germanium rectifiers, and the resultant DC voltage is selected and controlled by the variable transformer and range switch.

A. AC Regulating Circuit

The AC Regulating Circuit consists of the line voltage saturable transformer T1, linear reactor L1, and resonant capacitors. This circuit, which has a fast response (one to three cycle) delivers a regulated AC voltage to the variable auto-transformer T2.

B. Voltage Varying Circuit

The variable auto-transformer, T2, selectively controls the AC voltage applied to the step-down transformer T3. Note that this transformer has a tapped secondary in order to permit full dial rotation of T2, on all three output voltage ranges. This tapped secondary, in addition, minimizes the impedance on the lower voltage range.

C. DC Circuit

The Range switch, SW1, selects the range desired and applies the voltage to the rectifier S1. This rectifier is a low impedance germanium rectifier. Choke L2, together with Capacitors, serve to filter the DC voltage.

V. MAINTENANCE AND REPAIR

MAINTENANCE

During normal life this instrument requires no maintenance other than the care afforded similar equipment. It is suggested that excessive dust, etc., be removed periodically exercising care to prevent damage by cleaning tools or excessively strong air blasts.

SPARE PARTS

All components used in these instruments are of a good commercial grade and can be expected to give a reasonably long period of trouble free service. As the age of the instrument increases, some components are likely to deteriorate. We suggest that you note those items asterisked on the Parts List, which we recommend be kept on hand.

In the event it becomes necessary to replace any part, we strongly suggest that the replacement parts be of the same value as the original. Substitute parts should not be used unless we assure you that the substitute part will not impair the performance of the instrument.

REPAIR

CAUTION: DANGEROUS VOLTAGES EXIST IN THIS INSTRUMENT. PLEASE OBSERVE APPROPRIATE PRECAUTIONS.

Trouble Shooting Chart

Symptom	Cause	Procedure for Repair
No Output Voltage	Fuses blown Circuit Breaker trip Open Circuit Defective Rectifier S1	Replace fuse/reset breaker Test for continuity Check for normal AC voltage on T3 secondary. If this is present, replace rectifier S1.
Low Output Voltage (with voltage control full on)	Defective voltage regulating transformer	Check for normal AC voltage across T2. If this is not present, check T1, C1, and L1 for defect.
	Defective variable auto transformer or step down transformer	Check for normal AC voltage on these transformers Replace defect.
	Defective rectifier S1	Check for normal AC voltage on T3 secondary. If this is present, replace rectifier.

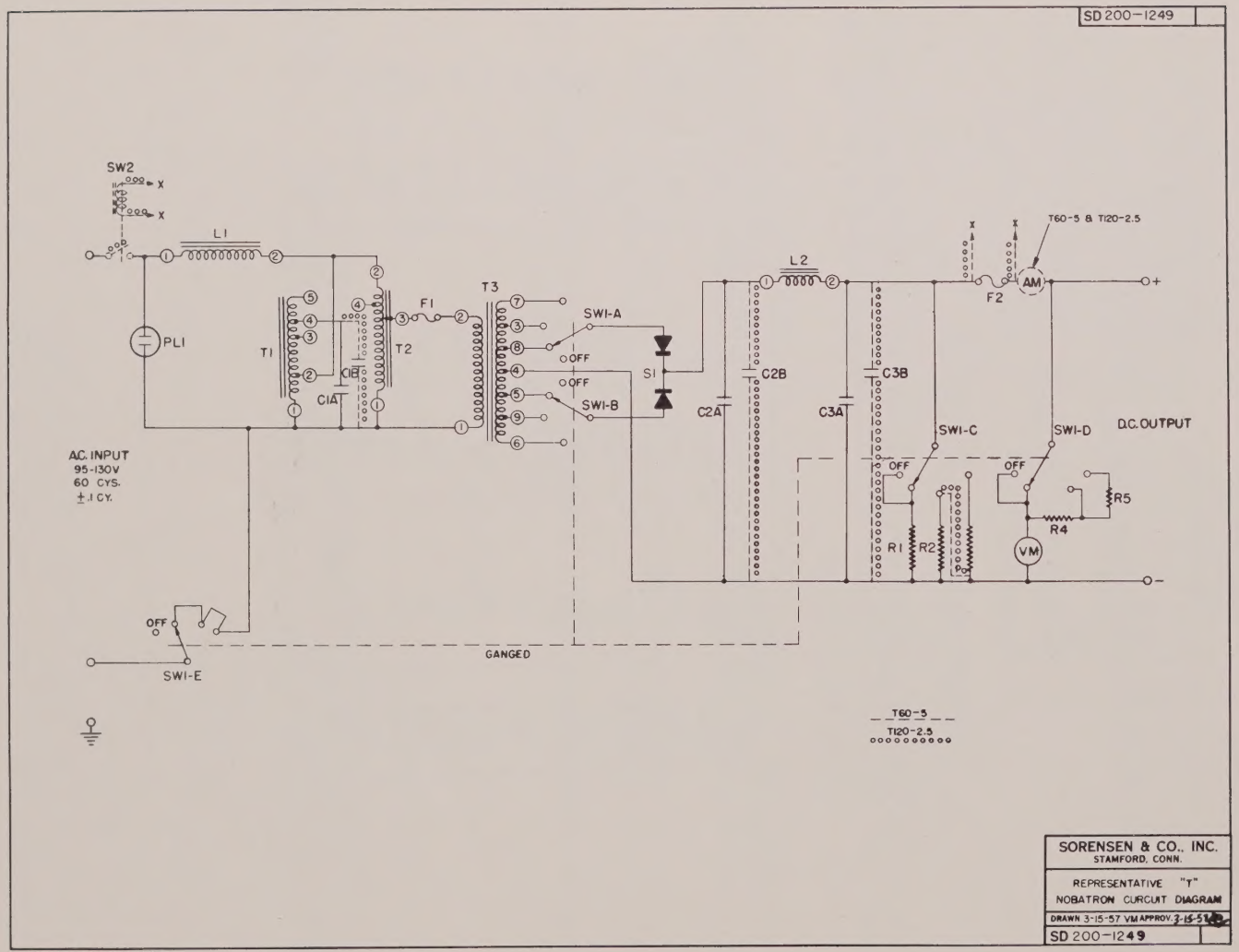
Trouble Shooting Chart (Cont'd.)

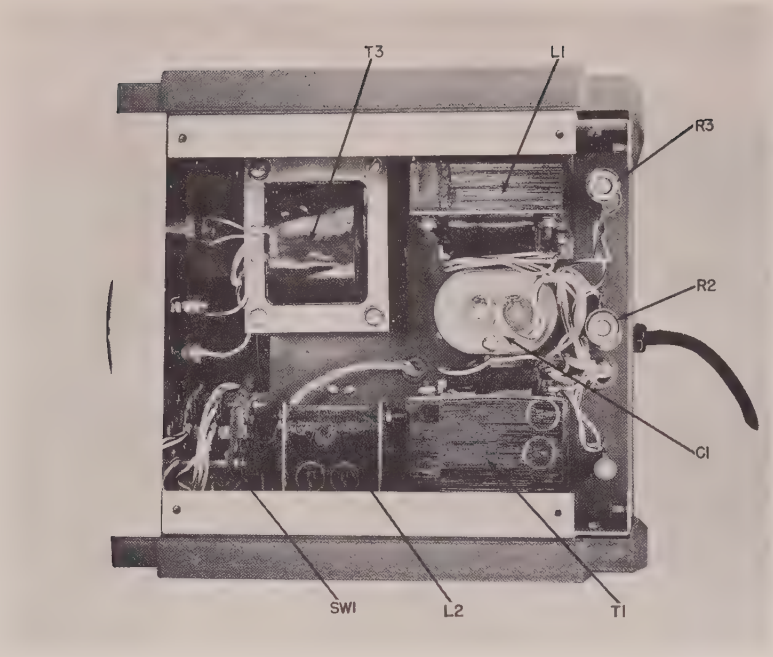
Symptom	Cause	Procedure for Repair
Poor Regulation or Reduction in Regulating Range	Defective Voltage Regulating Transformer	Check for normal AC voltage across T2. If this is not present, ;check T1, L1, and C1, and replace defective component.
High Ripple	Defective Capacitor C2	Check ripple across C2. Should be less than 1VAC.
	Defective DC Choke or Capacitor C3	Replace C3. If still high ripple, replace L2.

Typical Voltage Measurements

Typical circuit voltages are shown below. All voltage measurements should be taken with a 1000 ohm per volt meter. Checks should be made at 115VAC input, maximum output voltage and current.

Component	T50-1.5		T60-5		T120-2.5	
	Term.	Volts(AC)	Term.	Volts(AC)	Term.	Volts (AC)
T1	1&2	111	1&2	111	1&2	111
	3&4	620	1&4	668	1&4	670
L1	1&2	87	1&3	95	1&3	85
T2	1&2	111	2&4	112	2&4	112
	1&3	100	2&3	101	2&3	101
T3	1&2	100	1&2	101	1&2	101
	7&4	47	3&4	55	3&4	110
	6&4	47	6&4	55	6&4	110
	3&4	26	7&4	24	7&4	48
	9&4	26	9&4	24	9&4	48
	8&4	12	8&4	12	8&4	24
	5&4	12	5&4	12	5&4	24
L2	1&2	0.5VDC	1&2	0.25VDC	1&2	0.58VDC
SW1	-	-	1&2	0.45VDC	1&2	0.75VDC

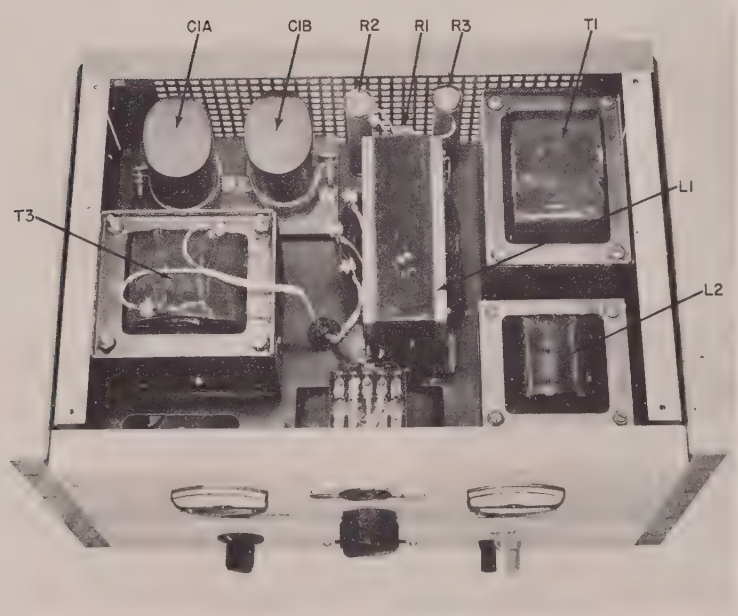

SD 200-1249
SW2
X
X
L1
PL1
T1
T2
C1B
C1A
F1
T3
SW1-A
OFF
OFF
SW1-B
S1
C2A
C2B
L2
C3A
C3B
T60-5 & T120-2.5
F2
AM
+
SW1-C
SW1-D
D.C. OUTPUT
OFF
OFF
R1
R2
R4
R5
VM
-
AC. INPUT
95-130V
60 CYS.
±1 CY.
OFF
SW1-E
GANGED
T60-5
T120-2.5
SORENSEN & CO., INC.
STAMFORD, CONN.
REPRESENTATIVE "T"
NOBATRON CURCUIT DIAGRAM
DRAWN 3-15-57 VM APPROV. 3-15-57
SD 200-1249



Model T50-1. 5 at Serial T256

CHASSIS LAYOUTS (TOP VIEWS)

Model T60-5 at Serial TA 9 *



* The Model T120-2. 5 is similar in appearance

REPLACEMENT PARTS LISTS

Listed below are the Replacement Parts for these instruments. Those items which we recommend be kept on hand as the age of the instrument increases are indicated by an asterisk.

MODEL T50-1.5

Schematic Symbol	Description	Sorensen Part No.	Specifications
R1	Resistor, 50 ohm, 10W	27-556	Ward Leonard 10F50
R2	Resistor, 100 ohm, 25W	27-741	Ward Leonard 25F100
R3	Resistor, 250 ohm, 25W	27-740	Ward Leonard 25F250
R4	Resistor, 15K ohm, 1/2W	27-985	Aerovox CP 1/2
R5	Resistor, 30K ohm, 1/2W	27-986	Aerovox CP 1/2
*C1	Capacitor, 2 mfd. 660VAC	24-368	Cornell Dubilier KD6020-2
*C2, 3	Capacitor, 2500 mfd, 80VDC	24-449	Sorensen Spec 14-1620
T1	Saturable Reactor Trans.	126-1627	Sorensen & Co.
T2	Variable Auto Trans.	91-953	Superior #B10
T3	Rectifier Input Trans.	126-1628	Sorensen & Co.
L1	Linear Reactor	127-1239	Sorensen & Co.
L2	D. C. Choke	127-1240	Sorensen & Co.
*S1	Rectifier	26-961	Gen. Elec. 4JA211CCIACI
*F1	Fuse, 1.5 amp, 3AG	42-407	Littlefuse 31201.5
*F2	Fuse, 1.5 amp, 3AG	42-407	Littlefuse 31201.5
*PL1	Pilot Lamp, 6-8V	42-301	Gen. Elec. NE51
SW1	Switch, 6 Circuit, 3 Pos.	45-215	Sorensen Spec. 45-215
VM	Voltmeter, 0-15/30/60VDC	94-261	Marion MM2

MODEL T60-5

Schematic Symbol	Description	Sorensen Part No.	Specifications
R1	Resistor, 15 ohm, 25W	27-744	Ward Leonard 25F15
R2, 3	Resistor, 40 ohm, 50W	27-880	Ward Leonard 50F40
R4	Resistor, 15K ohm, 1/2W	27-985	Aerovox CP 1/2
R5	Resistor, 30K ohm, 1/2W	27-986	Aerovox CP 1/2
*C1 (A&B)	Capacitor, 4 mfd. 660VAC	24-380	Sorensen Spec. 14-1514
*C2, 3 (A&B)	Capacitor, 4000 mfd. 80 VDC	24-472	Sangamo DCM per 24-472

REPLACEMENT PARTS LIST

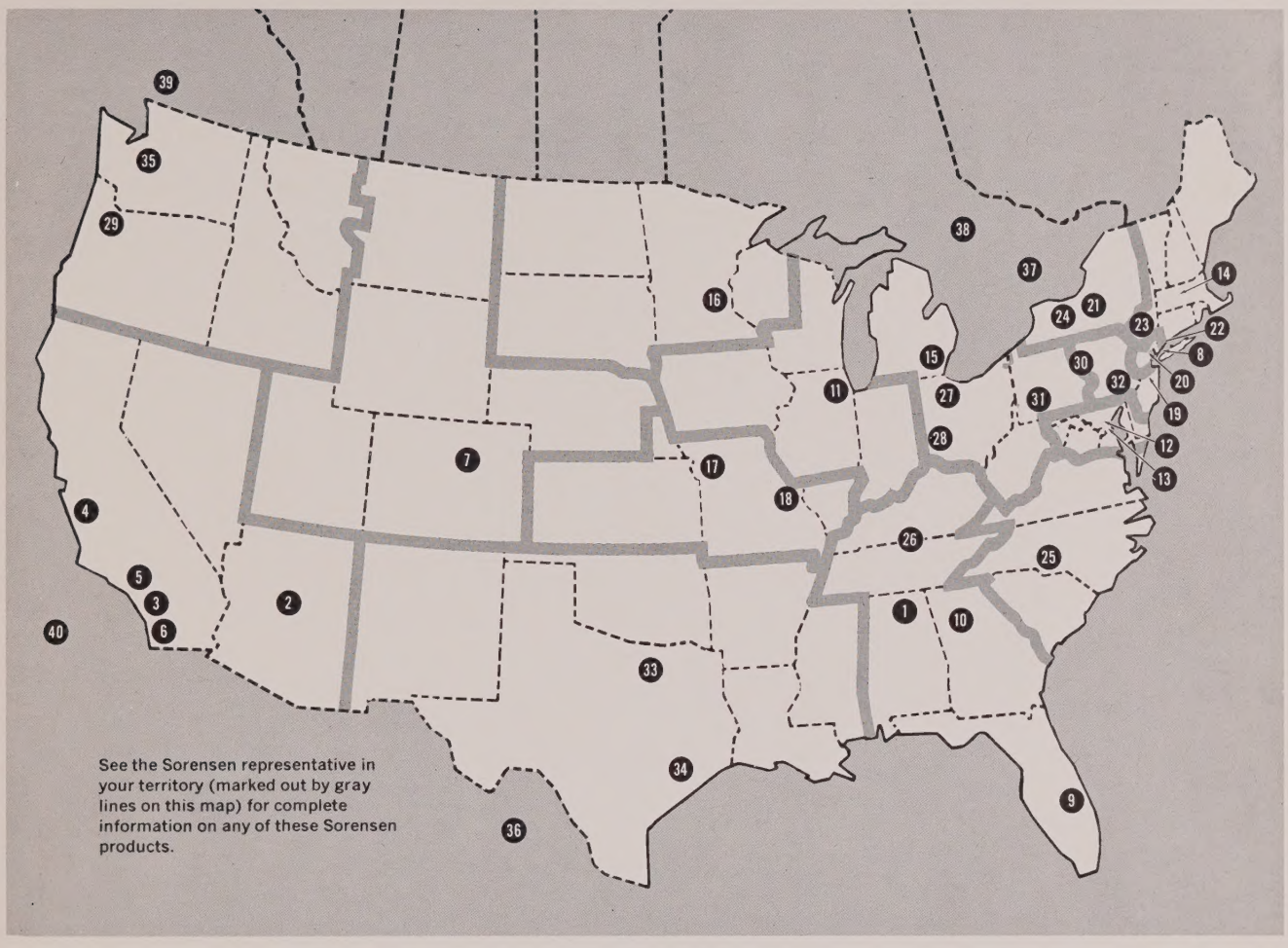
MODEL T60-5 (Cont'd.)

Schematic Symbol	Description	Sorensen Part No.	Specifications
T1	Saturable Transformer	126-1636	Sorensen & Co.
T2	Variac	91-869	General Radio Type W5
T3	Rectifier Input Trans.	126-1634	Sorensen & Co.
L1	Linear Reactor	127-1244	Sorensen & Co.
L2	D. C. Choke	127-1256	Sorensen & Co.
*S1	Rectifier	26-957	Gen. Elec. 4JA3011BH1AC1
*PL1	Pilot Lamp	42-301	Gen. Elec. NE51
*F1	Fuse, 5 amp., 3 AG	42-413	Littlefuse 312005
SW1	Switch, Rotary	45-221	Mallory 1323L
SW2	Circuit Breaker	92-260	Heinemann 8131KT
AM	Ammeter, 0-6 ADC	94-161	Marion MM2
VM	Voltmeter, 0-15/30/60VDC	94-261	Marion MM2

MODEL T120-2.5

Schematic Symbol	Description	Sorensen Part No.	Specifications
R1	Resistor, 80 ohm, 25W	27-745	Ward Leonard 25F80
R2, 3	Resistor, 160 ohm, 50W	27-885	Ward Leonard 50F160
R4	Resistor, 30 ohm, 1/2W	27-986	Aerovox Type CP 1/2
R5	Resistor, 90 ohm, 1/2W	27-515	Aerovox Type CP 1/2
*C1(A&B)	Capacitor, 4 mfd. 660VAC	24-380	Sorensen Spec. 14-1514
*C2, 3(A&B)	Capacitor, 2000 mfd. 80VDC	24-474	Sangamo DCM per 24-474
T1	Saturable Transformer	126-1636	Sorensen & Co.
T2	Variac	91-869	General Radio Type W5
T3	Rectifier Input Trans.	126-1675	Sorensen & Co.
L1	Linear Reactor	127-1244	Sorensen & Co.
L2	D. C. Choke	127-1287	Sorensen & Co.
*S1	Rectifier	26-087	Gen. Elec. 4JA211CC2AC2
*PL1	Pilot Lamp	42-301	Gen. Elec. NE51
*F1	Fuse, 5 amp., 3AG	42-413	Littlefuse 312005
SW1	Switch, Rotary	45-221	Mallory 1323L

Schematic Symbol	Description	Sorensen Part No.	Specifications
SW2	Circuit Breaker	92-261	Heinemann 8131KT
AM	Ammeter, 0-3 amp D. C.	94-162	Marion MM2
VM	Voltmeter, 0-30/60/150VDC	94-263	Marion MM2


See the Sorensen representative in your territory (marked out by gray lines on this map) for complete information on any of these Sorensen products.

1 ALABAMA — Huntsville *
Bivins & Caldwell, Inc.
JEfferson 2-5733

2 ARIZONA — Phoenix *
McCarthy Associates
111 Osborn West, Suite 213
CRestwood 9-1891

3 CALIFORNIA — Hollywood
Sorensen's West Coast Warehouse
Bekins Warehousing Corp.
1025 No. Highland Ave.

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McCarthy Associates
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DAvenport 6-7937

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1055 E. Walnut
SYcamore 2-8272

6 CALIFORNIA — San Diego *
McCarthy Associates
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BElmont 9-4015

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PEarl 3-3791

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FOrest 6-3456

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CHerry 1-1091

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3133 Maple Drive, N. E.
CEdar 3-7522

11 ILLINOIS — Chicago 45 *
Pivan Engineering Co.
2820 Peterson Avenue
BRiargate 4-9135

26 KENTUCKY
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High Point, North Carolina
High Point 2-6873

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3006 W. Cold Spring Lane
MOhawk 4-8345

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Horman Associates, Inc.
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HAzelwood 7-7560

14 MASSACHUSETTS — Burlington *
Yewell Associates, Inc.
Middlesex Turnpike
BRowning 2-9000

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S. Sterling Co.
15310 W. McNichols Rd.
BRoadway 3-2900

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Pinkney & Hine Company
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FEderal 8-0523

17 MISSOURI — Kansas City 30
Harris-Hanson Co.
7916 Paseo Avenue
Highland 4-9494

18 MISSOURI — St. Louis 17
Harris-Hanson Co.
2814 S. Brentwood Blvd.
MIssion 7-4350

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The I. E. Robinson Co.
905 Main Street
KEllogg 1-3150

20 NEW JERSEY — Englewood *
RMC Associates, Inc.
391 Grand Avenue
LOwell 7-3933

21 NEW YORK — Dewitt*
J. D. Ryerson Associates, Inc.
111 Kinne Road
Syracuse—GIbson 6-1771
Mail: P. O. Box 1400,
Syracuse, N. Y.

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TRafalgar 9-2023

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FRanklin 7-2546

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S. Sterling Co.
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REgent 7-6791

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TUxedo 4-5515

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FLanders 2-7017

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High Point, North Carolina
High Point 2-6873

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Earl Lipscomb Associates
P. O. Box 7084
FLeetwood 7-1881

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Earl Lipscomb Associates
P. O. Box 6646
3825 Richmond Avenue
MOhawk 7-2407

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MAin 2-0177

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ARVA *
355 Burrard St.—Room G7
Vancouver 1, B. C.
MUtual 1-3367

40 HAWAII
GENE PIETY FACTORS, INC.
2030 Home Rule Street
Honolulu 17, Hawaii
Phone 83105

**These representatives have service facilities.*

SORENSEN & COMPANY, INC.

Richards Avenue, South Norwalk, Connecticut

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